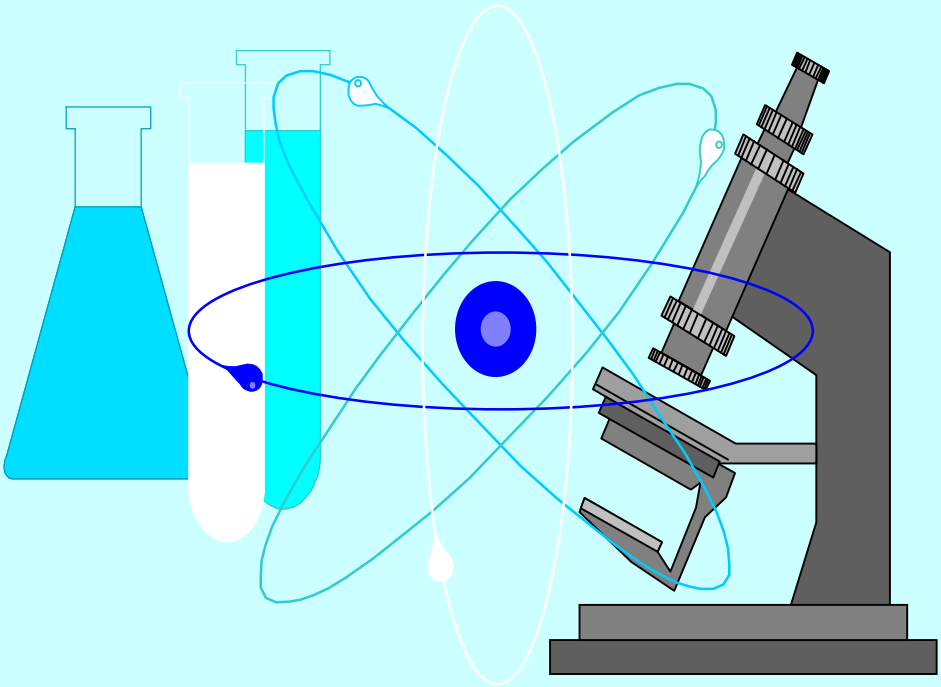
1998

Environmental Management Science Program

ANNUAL REPORT



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U.S. Department of Energy

Office of Environmental Management

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Environmental Management Science Program

We are pleased to provide this first Annual Report for the Environmental Management Science Program. This marks not only our third year of successful research project awards, but also the emergence of promising new results for the Department's cleanup program. Through the EMSP National Conference and a series of problem-specific workshops at DOE sites, EMSP researchers met one-to-one with environmental technology developers and cleanup project managers. These interactions have brought new ideas and expertise into the Environmental Management Program and have yielded promising scientific results that may improve cleanup technologies. These and other 1998 accomplishments are captured in this report, along with additional information on the background, current projects, and future direction of the EMSP.

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Introduction

The Environmental Management Science Program (EMSP) is a collaborative partnership between the DOE Office of Environmental Management (EM), Office of Science (DOE-SC), and the Idaho Operations Office (DOE-ID) to sponsor basic environmental and waste management related research. Results are expected to lead to reduction of the costs, schedule, and risks associated with cleaning up the nation's nuclear complex. The EMSP research portfolio addresses the most challenging technical problems of the EM program related to high level waste, spent nuclear fuel, mixed waste, nuclear materials, remedial action, decontamination and decommissioning, and health, ecology, or risk.

The EMSP was established in response to a mandate from Congress in the fiscal year 1996 Energy and Water Development Appropriations Act. Congress directed the Department to "provide sufficient attention and resources to longer-term basic science research which needs to be done to ultimately reduce cleanup costs, …develop a program that takes advantage of laboratory and university expertise, and …seek new and innovative cleanup methods to replace current conventional approaches which are often costly and ineffective". This mandate followed similar recommendations from the Galvin Commission to the Secretary of Energy Advisory Board. The EMSP also responds to needs identified by National Academy of Sciences experts, regulators, citizen advisory groups, and other stakeholders.

The mission of the EMSP is to develop and fund a targeted, long-term research program that will result in transformational or breakthrough approaches for solving the Department's environmental problems. The purpose is to provide the basic science knowledge that will lead to reduced remediation costs, schedule, or risk, or that will help alleviate otherwise intractable problems. EMSP research is focused on Department's cleanup problems and has explicit links to problem holders, including technical staff, managers, and stakeholder advisory groups at the sites. The goal is to support research that will:

- Lead to significantly lower cleanup costs and reduced risks to workers, the public, and the environment over the long-term.
- Bridge the gap between broad fundamental research that has wide-ranging applicability, such as that performed in the Office of Science, and needs-driven applied technology development conducted by the EM Office of Science and Technology (OST) Focus Areas.
- Serve as a stimulus for focusing the nation's science infrastructure on critical national environmental management problems.

> *"There is a particular need for long-term, basic research in disciplines related to environmental cleanup. Adopting a science-based approach that includes supporting development of technologies and expertise could lead to both reduced cleanup costs and smaller environmental impacts at existing sites and to the development of a scientific foundation for advances in environmental technologies."*
>
> *– Galvin Commission Report, 1995*

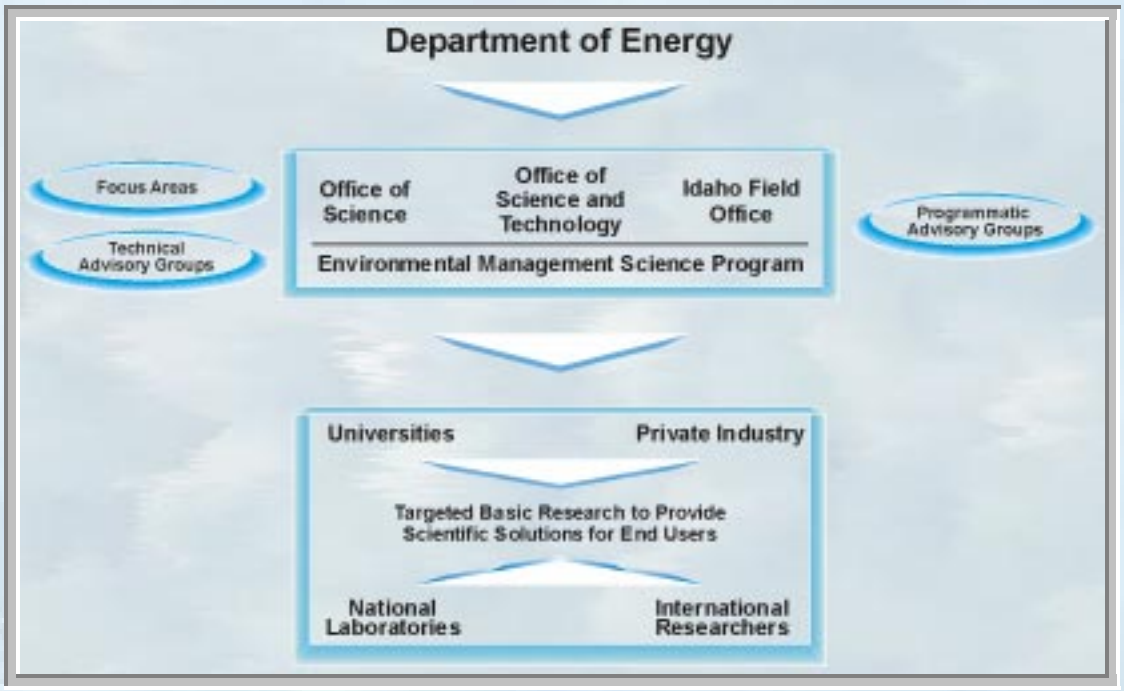
Research projects are solicited and awarded according to program needs of the DOE sites and the degree to which those needs can be influenced by scientific findings. Awardees conduct the research and interface with OST Focus Area representatives at multiple points during the projects. Research is integrated into technology development activities of the Focus Areas and site end-users through a number of facilitated interactions, such as topical and site-specific workshops, national workshops, and other EM program meetings.

EMSP Organization

EMSP's relationship to other programs is shown in the figure below. Integrating EMSP results with environmental technology development and end-user objectives is accomplished in cooperation and partnership with the EM/OST Office of Science and Risk Policy (OSRP), DOE-SC, and the DOE-ID. OSRP is the lead organization for planning and budgeting. It also provides policy and programmatic guidance, assists in soliciting research needs, ensures research as applicable to DOE cleanup problems, and communicates research results. DOE-SC provides input into programs policy development, manages the solicitation of research applications, oversees the scientific review process, and manages the scientific aspects of the Program. DOE-ID is the lead Field Office for program execution, which includes; assisting OSRP in analyzing science needs, providing procurement services, integrating research results, and managing grant funding. DOE-ID also serves as the interface with EM Focus Areas, Crosscutting Programs and other DOE Field Offices.

The EMSP has a number of technical advisory groups providing valuable input on both technical and programmatic matters. In the technical area, EM's Site Technology Coordinating Groups (STCGs) identify technology needs associated with all field sites and cleanup projects. The Focus Areas work with EMSP and the STCGs to evaluate the needs and set basic research directions. The EM Integration team identifies ways to improve efficiencies and cost savings throughout EM and identifies additional science priorities associated with critical waste streams.

Several programmatic advisory groups assist the EMSP with strategic and policy recommendations. The EM Federal Review Board and the EM Advisory Board (EMAB) advise and evaluate overall Program execution. The EMAB Science Committee reviews the processes used to select projects, provides recommendations on Program direction, and advises on EM science policy. DOE's Strategic Laboratory Council also advises the EMSP on planning and execution processes in order to ensure programmatic relevance and successful utilization of research results. The National Research Council/National Academy of Sciences provides periodic external peer review policy and recommendations.



EM Problem Areas and Science Needs

The DOE cleanup effort has identified key needs that must be addressed before the goals established in the Accelerating Cleanup: Paths to Closure document can be fully realized. These needs, which can be grouped according to the following seven problem areas, form the basis for EMSP research efforts. The Focus Areas formed to develop technologies to address these problems are the primary mode of moving the research results from the EMSP projects forward to operable cleanup technologies.

High Level Waste

The Department maintains over 300 large storage tanks containing over 90 million gallons of highly radioactive wastes, which include organic and inorganic chemical compounds in solid, colloidal, slurry, and liquid phases. The environment within the tanks is highly radioactive and chemically harsh. Some tanks have leaked contaminants into the environment, while many are near or beyond their design life. Key research needs include characterization and safety, tank waste retrieval and closure, waste pretreatment, and waste immobilization and disposal.

The Tanks Focus Area leads, coordinates, and facilitates science and technology development to support remediation of DOE's major tank sites. Activities cover all functions of a complete tank remediation system; characterization of the waste and tanks; waste retrieval, pretreatment, and immobilization; and tank closure.

The Mixed Waste Focus Area develops and implements technologies necessary to meet the Department's commitments for characterization, treatment, transportation, and disposal of mixed waste. Technical solutions are aligned with eight product lines focused on end-user needs.

Mixed Waste

Mixed low level and transuranic wastes, which contains both radioactive and hazardous materials, were generated during weapons production and testing projects, defense related experimental projects, and environmental management projects. Over 210,000 cubic yards of mixed waste is in storage, including over 1,400 mixed waste streams located at 37 sites in 19 states. An estimated 230,000 cubic yards of additional mixed waste will be generated over the next five years. Fundamental research is needed that could lead to innovative characterization, volume reduction and treatment methods.

Subsurface Contaminants

Soil and ground water contaminated with radionuclides, heavy metals, and dense, non-aqueous phase liquid (DNAPL) contaminants are found at nearly every DOE site. More than 5,700 plumes have contaminated over 600 billion gallons of ground water and 65 million cubic yards of soil. In addition, there are numerous landfills that contain nearly 4 million cubic yards of radioactive and hazardous buried waste, some of which has contaminated surrounding soils and ground water. Currently available cleanup technologies are often unacceptable due to excessive costs, increased risks, long remediation schedules, or production of secondary wastes. Research is needed to improve characterizing and delineating contamination, removal and remediation of contaminants, separation of radionuclides from hazardous compounds, and prediction of contaminant migration.

The Subsurface Contaminants Focus Area develops, demonstrates, and deploys innovative systems that accomplish containment and long-term isolation of buried waste areas and remediation of dispersed contamination including DNAPLs, metals, and radionuclides in the subsurface.

The Deactivation and Decommissioning Focus Area accelerates deployment of innovative technologies by comparing them side-by-side with existing commercial technologies in real-time, full-scale projects.

Deactivation and Decommissioning

DOE is addressing the problem of deactivation transformation of over 7,000 buildings and decommissioning over 900 buildings and their contents. Substantial quantities of metal and concrete must be decontaminated, and nearly 200,000 tons of scrap metal must be disposed of. Deactivation and Decommissioning activities across the complex will likely require decades to complete. Research is needed to develop or improve methods for the characterization, deactivation, decontamination, monitoring, and certification of facilities, as well as removal, control, treatment, and stabilization of Deactivation and Decommissioning derived waste. Scientific breakthroughs in these areas could reduce the schedule and associated long-term costs.

Spent Fuel

DOE is responsible for safely and efficiently managing its spent nuclear fuel -- radioactive rods withdrawn from nuclear reactors following irradiation. The fuel is treated, when necessary; packaged for repository disposal, when practicable; and placed in interim storage until it is ultimately placed in a repository. These actions remove remaining vulnerabilities, substantially reduce the cost of storage, and facilitate ultimate disposal. Areas for further research include non-destructive examination and characterization of spent fuel, pyrophoric and combustion stabilization, container stability and durability, alternative waste forms and disposal processes, and moisture removal techniques.

DOE manages spent fuel removed from its reactors and fuel returned from research reactors abroad.

The Nuclear Materials Focus Area identifies and recommends research and technological solutions to issues associated with plutonium stabilization and storage.

Nuclear Materials

Nuclear materials, such as plutonium, can be dangerous even in extremely small quantities, particularly if ingested or inhaled. In addition, finely divided plutonium dust may spontaneously ignite when exposed to air above certain temperatures. Extreme precautions are required in storing, handling, and transporting such materials. DOE's plutonium and other nuclear materials exist in a variety of forms -- from acid solutions, to rough pieces of metal, to nearly finished weapons parts. In addition, unknown amounts of plutonium have collected on the surfaces of ventilation ducts, air filters, and gloveboxes at some DOE facilities. Metal and chemical wastes containing nuclear materials typically are stored in drums and monitored, pending ultimate disposition. Research is needed to support technologies that can characterize and convert or stabilize nuclear materials for safe management.

Ecology/Health/Risk

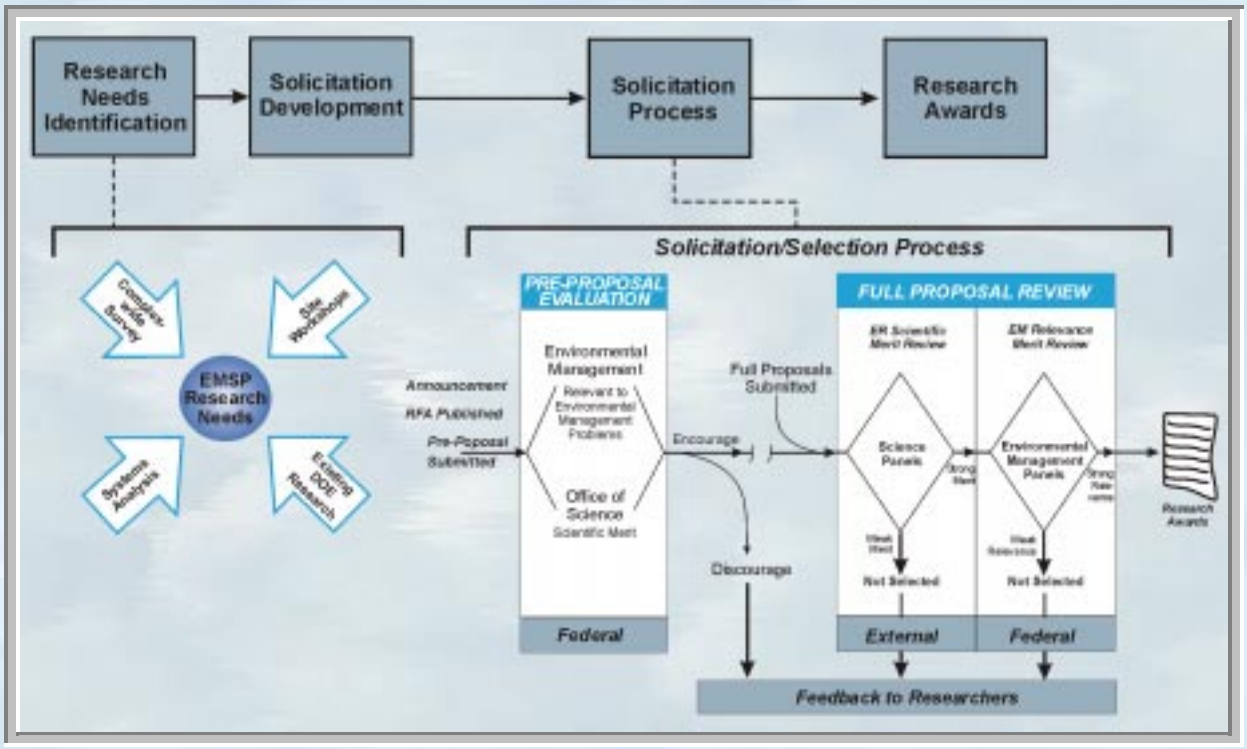
There is scientific uncertainty as to what constitutes a safe level of risk to human health and the environment for the end state of the Department's cleanup effort. Accurate risk analyses require thorough knowledge of contaminant characteristics, basic ecological processes and principles, rates at which contaminants move through ecosystems, and other health and ecological effects. Research is needed to define radionuclide and toxic chemical transport dynamics and potential effects of long-term exposure to low levels of radionuclides, in combination with other contaminants. Research is also required to improve the understanding of threatened and damaged ecosystems and to develop processes to restore viability and quality to these systems.

EMSP Project Selection Process

In order to address these basic science needs, the EMSP has developed an innovative process for seeking the broadest possible involvement of government and non-government organizations and researchers. The EMSP process for the submission of proposals/applications for research grants is shown below. Requests for grant applications (RFA) are announced in the Commerce Business Daily and published in the Federal Register in addition to direct announcements to universities and laboratories to ensure wide participation by the scientific community. Awards are competitively made, based on applications that best demonstrate both scientific merit and the potential to lead to new and improved solutions to EM's cleanup problems.

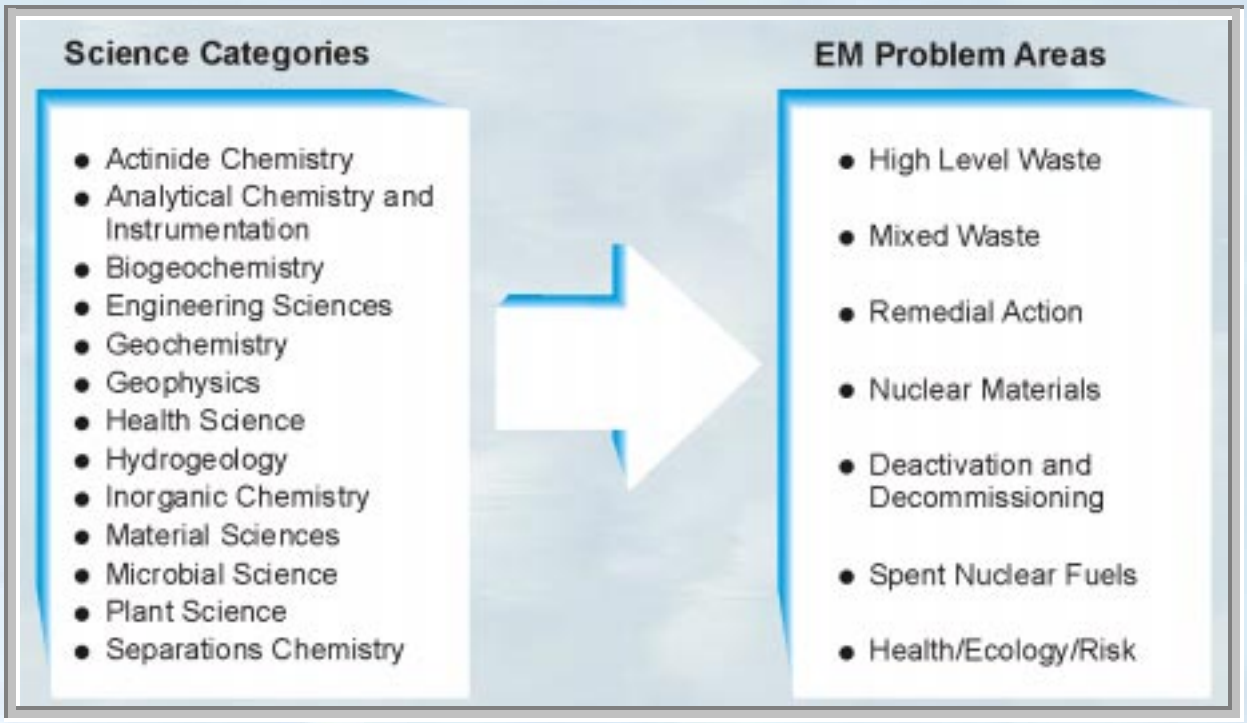
EMSP's process for selecting research awards received the Vice President's Hammer award for its innovative approach, which involves optional pre-proposals, followed by full proposal/grant application submittals. By encouraging the best pre-proposals, this two-phase process saves both time and effort for researchers, and enhances the quality of full proposals. EMSP's RFAs clearly communicate research needs and focus researchers on DOE's most intractable cleanup problems or problems needing better solutions. A number of information sources are used to identify these research needs; including site-specific workshops, a complex-wide research needs survey, EM Technology Focus Areas, and the Project Baseline Summary information developed for the *Paths to Closure* document.

Pre-proposals and full proposals are peer reviewed by panels of scientists and engineers from DOE sites to evaluate both scientific merit and relevance to identified EM problems and needs. A two-phase formal review process is used to ensure awards are made to the most meritorious and relevant applications. The initial phase involves evaluations by external peer reviewers who are experts in specific scientific disciplines. The second phase involves review of the scientifically meritorious proposals by DOE Program and Focus Area Managers who are most familiar with EM problems and may be potential users of the research results. Funding is recommended only for those applications that are successful in both reviews.



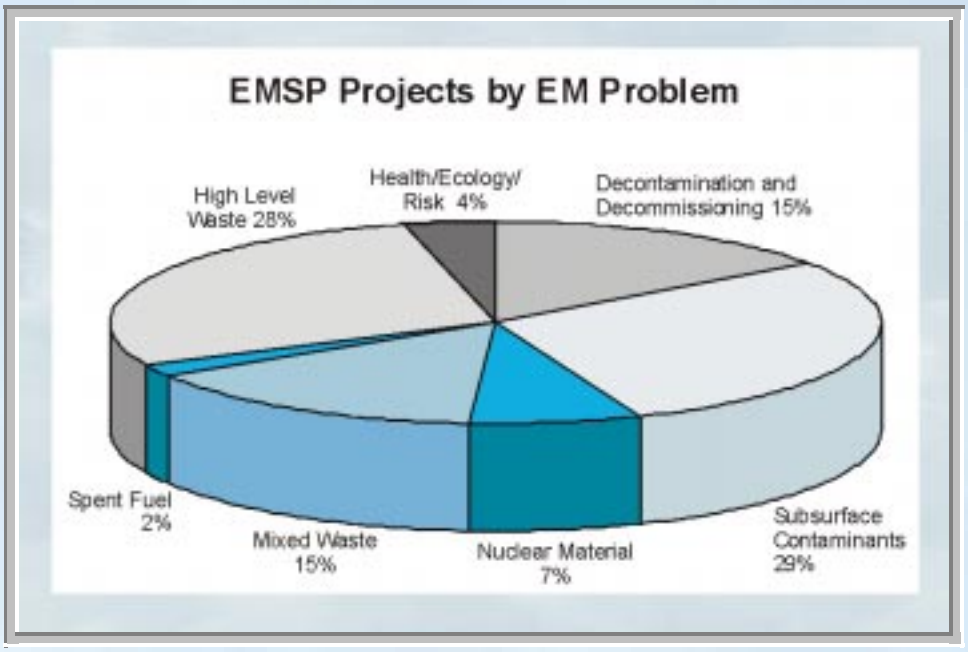
Addressing DOE's environmental management problems and research needs requires the expertise from a variety of scientific disciplines, such as chemistry, geology, physics, and biology. From these broad disciplines, 13 science categories shown in the following figure have been used in the EMSP's project merit review and selection process. They reflect traditional areas of expertise within the scientific community and facilitate identification of well-qualified technical reviewers. Each science category may represent several sub-categories. For example, engineering science includes such diverse fields as bioengineering, diagnostics, robotics, and design/process modeling. Taken together, the sub-categories reflect the essential scientific underpinning necessary for long-term solutions to EM problems.

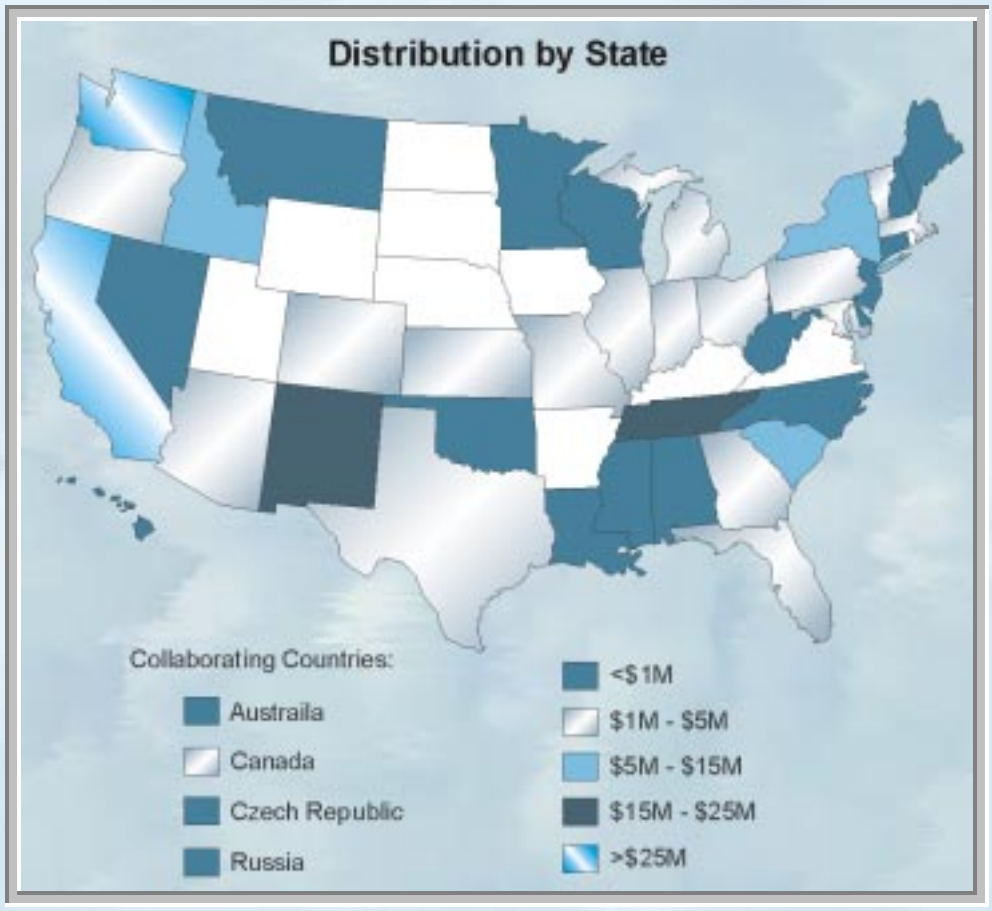
While EMSP research awards address many cleanup needs, they are not generally intended for application at specific sites. In fact, a given research project is likely to address several site-specific problems, or in some cases it may be relevant to more than one EM problem area. The table of EMSP projects provided at the end of this document identifies the primary EM problem addressed by each research project.



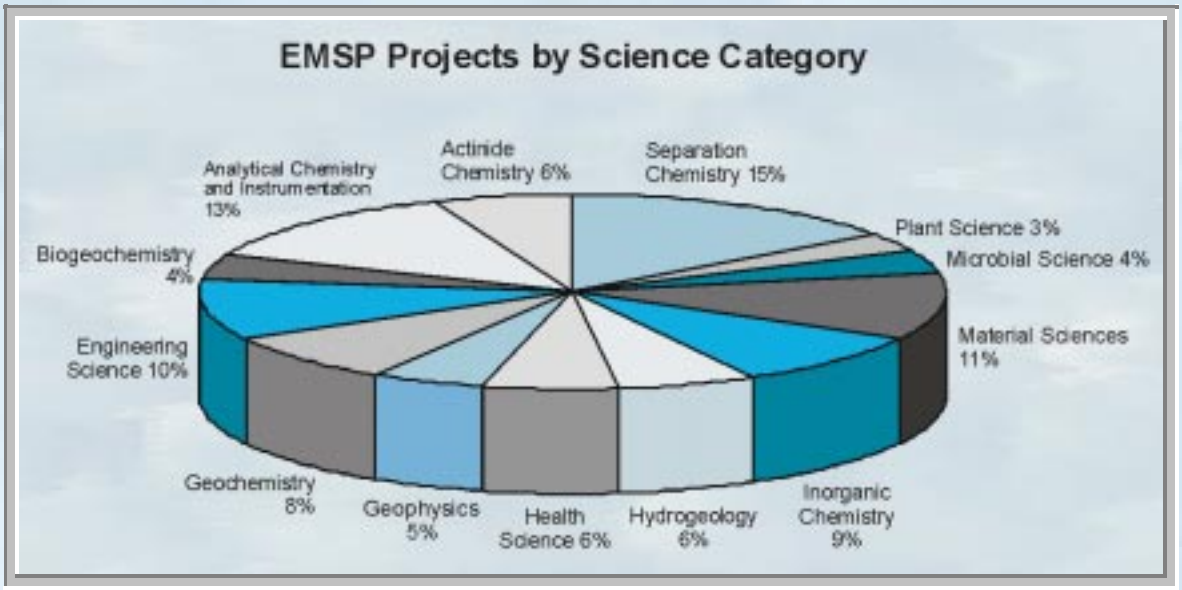
Current Research Portfolio

Since its inception in Fiscal Year 1996, EMSP has invested over $190 million in support of 235 research projects. This investment has provided funding for 328 researchers at 89 universities, 13 national laboratories, and 21 other governmental and private laboratories. Research is being conducted in 36 states and the District of Columbia, two Canadian provinces, Australia, Russia, and the Czech Republic (see map on the following page). The distribution of the projects by problem and by location is shown on the following page.


EMSP Projects by EM Problem
High Level Waste 28%
Health/Ecology/ Risk 4%
Decontamination and Decommissioning 15%
Spent Fuel 2%
Mixed Waste 15%
Nuclear Material 7%
Subsurface Contaminants 29%

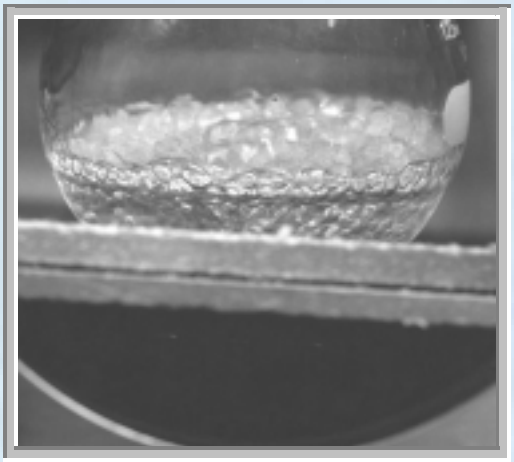

Distribution by State
Collaborating Countries:
Austraila
Canada
Czech Republic
Russia
<$1M
$1M - $5M
$5M - $15M
$15M - $25M
>$25M

There were 202 awards funded prior to 1998, which included over $160 million distributed across all 13 science categories. These awards also covered the seven EM problem areas, with research being conducted in 34 states, Canada and Australia. After these early awards, the grants have become focused on particularly intractable problems. In Fiscal Year 1998, 33 three-year grants were awarded to respond to needs in the areas of high level waste and deactivation and decommissioning. Drawing on expertise available from abroad, particularly in high level waste, the 1998 awards also included grants to researchers in the Czech Republic and Russia.



Early Successes

While most EMSP projects are based on three-year grants, useful results are already emerging. These research results may be instrumental in developing not only new tools for environmental cleanup, but also in improving the understanding of scientific principles that underlie conventional cleanup methods. The following are examples of some early EMSP results that could provide significant benefits to EM's cleanup effort.



Research in materials sciences conducted under the auspices of the EMSP has resulted in a greater understanding of the processes that result in blockage of waste transmission lines. Preventing these blockages is critical to the safe and cost effective cleanup of the high level waste storage tanks.

One high level waste research project, being led through Pacific Northwest National Laboratory, focuses on a key problem in processing radioactive wastes where insoluble sludges clog transfer lines or interfere with solid-liquid separations. In order to control the problem, better understanding of the characteristics and mechanisms for controlling the physical properties of sludge suspensions, which consist of submicron colloidal particles, is needed. The project focuses on the factors controlling colloidal agglomeration, determining how agglomeration influences slurry rheology, and developing strategies to control agglomeration. Early results are pointing the way to optimization of waste processing conditions for retrieval, transport, and separation of the waste currently in tank storage.

A research project in the mixed waste problem area, being conducted at Los Alamos National Laboratory, is developing a high flux neutron source for nondestructive assay of containerized TRU waste at DOE sites. This research could lead to a more stable and powerful neutron source, which would improve assay results. Some potential applications are the characterization of TRU wastes for mixed waste residues prior to stabilization and disposal, cemented or vitrified wastes, spent nuclear fuel, and high level wastes.

Characterization of the contents of containers, without the need to directly sample them will allow safer and faster processing of the waste now in storage at DOE facilities, while reducing cost.

Exploiting the recent breakthroughs in genetic manipulation is expected to yield new methods for the cleanup of radiologic and or hazardous waste contamination.

Basic research at the University of Georgia addressing the remedial action problem area deals with Mercury contamination in soils. This work uses genetic engineering to transfer properties from a soil bacteria to plants which would allow them to degrade mercury into a less toxic form. These plants can then be grown in contaminated areas where they could withdraw mercury from the soil and reduce its toxicity. This work is expected to lead to the development of a passive method for remediation for mercury and possibly other contaminants.

Another remedial action project deals with the problem of water flow processes in mixed soil or fractured rock environments in the vadose zone (that is, above the ground water table). Researchers at Lawrence Berkeley National Laboratory have developed equations that describe the pattern of fractures in basalt and the trajectory of flow paths in the basalt. The results of this research may change the approach used to predict flow and transport of groundwater and contaminants in fractured media. With this information in hand, the environmental restoration program stands the best chance of stopping contaminants before they seep into the water table.

The ability to accurately predict the flow of contaminants in fractured rock will quickly focus the cleanup efforts on the contamination zones, eliminating much of the cost and time required for extensive sampling.

Expanding the use of microbiologic treatment to include radionuclides offers the potential of treating both the hazardous and radiological components of mixed waste in the same process.

In the problem area of mixed low level waste, the mixture of toxic chemicals, heavy metals, halogenated solvents and radionuclides in many DOE waste materials, presents the challenging problem of separating the different species and disposing of individual contaminants. A microbiological treatment system is an attractive possibility for separation and treatment. A project is being conducted at the University of Washington to develop organisms capable of detoxifying metals, such as mercury, and halogenated organics in mixed waste. This research involves cloning these beneficial properties from other bacteria into a bacteria strain that is highly resistant to radioactivity.

Communicating Results

The EMSP uses several means to facilitate communications and collaboration, including the Internet, conferences, workshops, and progress reports. This year, EMSP published a comprehensive, 3-volume Report to Congress, which details all aspects of the program and contains abstracts for all projects. The report and project abstracts are available in hardcopy, on CD-ROM, and at the EMSP web page (emsp.em.doe.gov).

In July 1998, a national workshop was held in Chicago to review the progress of all research projects. Over 470 attendees included researchers, potential researchers, and end users. This conference provided the end users a forum to learn about the ongoing EMSP sponsored projects through presentations and poster sessions, as well as an opportunity to interact directly with the 210 attending researchers.

Further background on the EMSP and project summaries are available in hardcopy report, on CD-ROM, and on the Internet (emsp.em.doe.gov).

In addition to this major event, several site-specific EMSP workshops were held at key DOE locations. In July, the Savannah River Site hosted a remedial action workshop attended by 80 participants. EMSP project results were presented in three areas: metals and radionuclide contaminant remediation, DNAPL's contaminant characterization and bioremediation, and phytoremediation of subsurface contaminants.

In October, the Idaho National Engineering and Environmental Laboratory hosted an EMSP workshop targeted at deactivation and decommissioning, high level waste/calcine treatment, and contaminants in fractured rock. Attracting over 130 participants, the workshop provided a series of presentations, technical breakout sessions, and site tours to bring researchers together with technology end-users at the site.

EMSP also sponsored a high level waste workshop in November at Richland, WA. Designed to enhance collaboration between new EMSP awardees and Tanks Focus Area technology developers, it included over 50 participants from eight federal laboratories, nine universities, and DOE Headquarters and Operations Offices. Three breakout sessions dealt with tank waste characterization, high level waste retrieval and pretreatment, and tank remediation. Twenty-two new EMSP researchers gained insight into a variety of Tanks Focus Area science needs.

Looking to the Future

Two new EMSP solicitations for research grants are planned for 1999. The first will address subsurface contaminants in the vadose zone, focusing on contaminant inventory measurement, characterization, and validation; hydrology and geochemistry; contaminant transport modeling; and cumulative toxicological effects of surface water contaminants. The second solicitation will address low dose radiation effects, with emphasis on biological responses to radiation and oxidative damage, differences between low dose radiation and endogenous oxidative effects, potential thresholds for low dose radiation effects, genetic factors affecting individual susceptibility, and effective communication of results.

Results from these solicitations could have great potential impact on the EM cleanup program. For example, better understanding of fate and transport of contaminants through the vadose zone is needed to address remediation of leaking underground storage tanks and other potential source areas across the Complex. Research into low dose radiation effects may prove to be beneficial in establishing safe exposure scenarios, potentially saving billions of dollars in deactivation and decommissioning and restoration costs.

> *"There is no way to forecast the impact of carefully chosen, high-quality projects, but the environmental management problems are so large and the predicted cost of cleanup so great, that the modest investment in the EMSP is viewed as worthwhile."*
>
> *- National Research Council*

The 136 EMSP funded research projects initiated in FY 1996 will reach the end of their initial three years of funding in September 1999. Many of these initial projects have been highly productive. So stated earlier, the EMSP is a targeted, long-term research program and it is therefore anticipated that funding for many of these projects will be renewed for FY 1999 or FY 2000. The ultimate goal will be to transfer the scientific and engineering knowledge from these projects to EM stakeholders, including, EM/OST Focus Areas and the site problem holders. EMSP is evolving to provide increased opportunities for researchers and problem holders to collaborate during the project research phase to ensure that results are integrated into applied technology development designed to solve EM problems. Efforts will focus on publishing research findings, identifying and enrolling advocates for research projects, fostering dispositions of mature research to other interested developers, and encouraging Focus Areas to continue the research started by EMSP researchers.

EMSP Project Table

The following table lists EMSP projects funded to date, according to their scientific categories, year of award, primary research institution, and EM problem area. Project titles are abbreviated; however, grant numbers are consistent with abstracts found in other EMSP publications and web site descriptions.

EMSP Projects

Year	Grant No.	Title	Primary Research Institution	Problem Area	Funding ($000)
Actinide Chemistry					
1996	54595	f-Element Ion Chelation in Highly Basic Media	University of New Mexico	HLW	500
1996	54621	Chemical Speciation of Strontium, Americium, and Curium in High Level Waste	Pacific Northwest National Laboratory	HLW	1,051
1996	54679	Architectural Design Criteria for F-Block Metal Ion Sequestering Agents	Pacific Northwest National Laboratory	MW	1,800
1996	54893	Research to Determine Redox Properties and Their Effects on Speciation and Mobility of Pu	Florida State University	RA	875
1997	59977	Templated Ion Exchange Resins Synthesis and Characterization for Selective Actinide Ions Complexation	Johns Hopkins University Applied Physics Lab	HLW	302
1997	60370	Rational Design of Metal Ion Sequestering Agents	Lawrence Berkeley National Laboratory	MW	405
1997	59967	Aqueous Electrochemical Mechanisms in Actinide Residue Processing	Los Alamos National Laboratory	NM	750
1997	60319	Thermodynamics of Actinide Metals Volatilization in the High-Temperature Treatment of Radioactive Wastes	Lawrence Livermore National Laboratory	NM	900
1998	65318	Actinide-Aluminate Speciation in Alkaline Radioactive Waste	Los Alamos National Laboratory	HLW	1,334
1998	65352	The Effect of Temperature and Electrolyte Concentrations on Actinide Speciation in HLW	Washington State University	HLW	865
1998	65370	Actinide-Specific Interfacial Chemistry of Monolayer Coated Mesoporous Ceramics	Pacific Northwest National Laboratory	HLW	1,200
1998	65398	Characterization of Actinides in Simulated Alkaline Tank Waste Sludges and Leach Solutions	Argonne National Laboratory	HLW	930
Analytical Chemistry and Instrumentation					
1996	54674	Design and Development of a New Hybrid Spectroelectrochemical Sensor	University of Cincinnati	HLW	850
1996	55318	Improved Analytical Characterization of Solid Waste Forms by Development of Laser Ablation Technology	Lawrence Berkeley National Laboratory	HLW	1,229
1996	54751	High Fluence Neutron Source for Nondestructive Characterization of Nuclear Waste	Los Alamos National Laboratory	MW	745
1996	54864	Supramolecular Chemistry of Selective Anion Recognition for Anions of Environmental Relevance	University of Kansas	MW	775
1996	55146	Adsorption/Membrane Filtration as a Contaminant Concentration and Separation	University of Washington	MW	610
1996	55171	Advanced In Situ Techniques for Chemistry Monitoring and Corrosion Mitigation in SCWO Environments	Pennsylvania State University	MW	696
1996	55247	Ion and Molecule Sensors Using Molecular Recognition in Luminescent, Conductive Polymers	Argonne National Laboratory	MW	1,500
1996	54639	In-Situ Microsensor Development for Measurements of Cr and Ur in Ground water	New Mexico State University	RA	690
1996	54800	Construction of Bending Magnet Beamline at the APS for Environmental Studies	University of Washington	RA	810
1996	55108	Monitoring Genetic & Metabolic Potential for In Situ Bioremediation	Oak Ridge National Laboratory	RA	1,080
1996	55205	Study of Laser-Induced Breakdown Spectroscopy Using Fiber Optics for Remote Measurements of Trace Metals	University of South Carolina	RA	630

Year	Grant No.	Title	Primary Research Institution	Problem Area	Funding ($000)
1996	55328	Novel Analytical Techniques Based on an Enhanced Electron Attachment Process	University of Tennessee - Knoxville	RA	540
1997	60283	Waste Volume Reduction Using Surface Laser Ablation Characterization and Decontamination	Argonne National Laboratory	D&D	790
1997	60163	Investigation of Techniques to Improve Continuous Air Monitors Under Conditions of High Dust Loading	New Mexico Institute of Mining & Technology	H/E/R	310
1997	60218	Novel Mass Spectrometry Mutation Screening for Contaminant Impact Analysis	Oak Ridge National Laboratory	H/E/R	600
1997	60474	Ultrahigh Sensitivity Heavy Noble Gas Detectors for Long-Term Monitoring and Monitoring Air	University of Cincinnati	H/E/R	609
1997	59978	Thermospray Mass Spectrometry Ionization Processes	Oak Ridge National Laboratory	HLW	590
1997	60075	Particle Generation by Laser Ablation in Support of HLW Chemical Analysis	Washington State University	HLW	544
1997	60217	Optically-Based Array Sensors for Selective in Situ Analysis of Tank Waste	Oak Ridge National Laboratory	HLW	600
1997	60219	Development of Advanced Electrochemical Emission Spectroscopy for Monitoring Corrosion	Pennsylvania State University	HLW	350
1997	60424	High Temperature Condensed Phase Mass Spectrometric Analysis	Idaho National Engineering and Environmental Laboratory	HLW	680
1997	59981	Broad Spectrum Characterization of Hazardous Waste by Membrane Introduction Mass Spectrometry	Los Alamos National Laboratory	MW	655
1997	60070	Development of Cavity Ringdown Spectroscopy as a Sensitive Continuous Emission Monitor for Metals	Mississippi State University	MW	538
1997	60231	Novel Miniature Spectrometer for Remote Chemical Detection	National Institute of Standards & Technology	MW	549
1997	60247	Miniature Nuclear Magnetic Resonance Spectrometer for In-Situ and In-Process Analysis and Monitoring	University of Illinois	NM	482
1997	60197	Microsensors for In-site Chemical, Physical, and Radiological Characterization of MW	Oak Ridge National Laboratory	RA	615
1997	60141	Gamma Ray Imaging for Environmental Remediation	Naval Research Laboratory	SNF	780
1998	64982	Metal Ion Analysis Using Near-Infrared Dyes	Naval Research	D&D	471
1998	65001	Development of Novel, Simple Multianalyte Sensors for Remote Environmental Analysis	University of Pittsburgh	D&D	650
1998	65004	Real-Time Identification and Characterization of Asbestos and Concrete Materials with Radioactive Contamination	Rensselaer Polytechnic Institute	D&D	600
1998	65340	Detection and Characterization of Chemicals Present in Tank Waste	Oak Ridge National Laboratory	HLW	1,005
1998	65421	Correlation of Chemisorption and Electronic Effects for Metal/Oxide Interfaces	National Institute of Standards & Technology	HLW	1,070
1998	65425	Mass Spectrometric Fingerprinting of Tank Waste Using Tunable, Ultrafast Infrared Lasers	Vanderbilt University	HLW	760
1998	65435	Millimeter-Wave Measurements of High Level and Low Activity Glass Melts	Massachusetts Institute of Technology	HLW	1,430

Year	Grant No.	Title	Primary Research Institution	Problem Area	Funding ($000)
Biogeochemistry					
1996	54683	Speciation and Structural Characterization of Actinide-Organic Complexes in Surface and Ground waters	Woods Hole Oceanographic Institute	RA	823
1996	54790	Microbial Mineral Transformations at the Fe(II)/Fe(III) Redox Boundary	University of Toronto	RA	502
1996	55071	Reduction and Immobilization of Radionuclides and Toxic Metal Ions Using Combined Zero Valent Iron and Anaerobic Bacteria	University of Maine	RA	356
1996	55164	Advanced Experimental Analysis of Controls on Microbial Fe(III) Oxide Reduction	University of Alabama	RA	427
1996	55267	Containment of Toxic Metals and Radionuclides in Porous and Fractured Media	Oak Ridge National Laboratory	RA	1,235
1996	55388	Stable Isotopic Investigations of In Situ Bioremediation of Chlorinated Organic Solvents	Argonne National Laboratory	RA	825
1997	60015	Long-term Risk from Actinides in the Environment: Modes of Mobility	Los Alamos National Laboratory	H/E/R	900
1997	59996	Plutonium Speciation, Solubilization, and Migration in Soils	Los Alamos National Laboratory	RA	750
1998	64907	“Green” Biopolymers for Improved Decontamination of Metals from Surfaces	Oak Ridge National Laboratory	D&D	900
1998	64931	Microbially Promoted Solubilization of Steel Corrosion Products and Fate of Associated Actinides	Pacific Northwest National Laboratory	D&D	1,406
Engineering Science					
1996	55052	Advanced Sensing and Control Techniques to Facilitate Semi-Autonomous Decommissioning	Clemson University	D&D	871
1996	54656	Mixing Processes in HLW Tanks	University of California at Berkeley	HLW	417
1996	54890	On-Line Slurry Viscosity and Concentration Measurement as a Real-Time Waste Stream Characterization Tool	University of California, Davis	HLW	691
1996	55179	Acoustic Probe for Solid-Gas-Liquid Suspensions	Syracuse University	HLW	751
1996	55294	Superconducting Open-Gradient Magnetic Separation for Pretreatment of Waste Vitrification Feeds	Argonne National Laboratory	HLW	1,500
1996	54973	Novel Energy-Efficient Plasma Chemical Process for Volatile Toxic Compounds Destruction	Oak Ridge National Laboratory	MW	980
1996	55211	Cavitational Hydrothermal Oxidation: A New Remediation Process	University of Illinois	MW	478
1996	54857	Surface Nuclear Magnetic Resonance Imaging of Subsurface Water Content Distribution	New Mexico Institute of Mining & Technology	RA	638
1996	55374	Use of Sonication for In-Well Softening of Semivolatile Organic Compounds	Argonne National Laboratory	RA	1,470
1997	60040	Development of Monitoring and Diagnostic Methods for Robots Used in Remediation of Waste Sites	Mechanical Technology, Inc.	D&D	403
1997	60143	Foaming in Radioactive Waste Treatment and Immobilization Processes	Illinois Institute of Technology	HLW	360
1997	60451	Mechanics of Bubbles in Sludges and Slurries	Pacific Northwest National Laboratory	HLW	1,132
1997	60155	Measurements and Models for Hazardous Chemical and MWs	National Institute of Standards & Technology	MW	500

Year	Grant No.	Title	Primary Research Institution	Problem Area	Funding ($000)
1997	60326	Isolation of Metals from Liquid Wastes: Reactive Scavenging in Turbulent Thermal Reactors	University of Arizona	MW	1,075
1997	60077	Development of Nuclear Analysis Capabilities for DOE Waste Management Activities	Oak Ridge National Laboratory	NM	600
1997	60144	Flow Visualization of Forced and Natural Convection in Internal Cavities	University of Idaho	SNF	1,077
1998	64947	Contaminant-Organic Complexes; Structure and Energetics in Surface Decontamination Processes	Pacific Northwest National Laboratory	D&D	1,242
1998	64979	PCB D&D of Sites: Extraction, Electrokinetics, and Hydrothermal Oxidation	South Carolina University Research an Education Foundation	D&D	980
1998	65015	Three-Dimensional Positron-Sensitive Germanium Detectors	Lawrence Berkeley National Laboratory	D&D	750
1998	65328	Electrically Driven Technologies for Radioactive Aerosol Abatement	Oak Ridge National Laboratory	HLW	830
1998	65371	Numerical Modeling of Mixing of Chemically Reacting, Non-Newtonian Slurry for Tank Waste Retrieval	University of Minnesota	HLW	658
1998	65410	Study of Rapid Migration of Radinuclides Leaked from HLW Tanks	Pacific Northwest National Laboratory	HLW	905
Geochemistry					
1996	54548	Efficacy of Oxidative Coupling for Promoting In-Situ Immobilization in Contaminated Soil and Sediment Systems	University of Michigan	H/E/R	557
1996	55042	Quantifying Silica Reactivity in Subsurface Environments	Georgia Institute of Technology	HLW	359
1996	54585	Permanganate Treatment of DNAPLs in Reactive Barriers and Source Zone Flooding Schemes	Ohio State University	RA	351
1996	54635	Molecular-Level Process Governing the Interaction of Contaminants with Iron and Manganese Oxides	Pacific Northwest National Laboratory	RA	1,450
1996	54741	Characterization of Contaminant Transport Using Naturally-Occurring U-Series Disequilibria	Los Alamos National Laboratory	RA	900
1996	54823	Modeling of Cation Binding in Hydrated 2:1 Clay Minerals	New Mexico State University	RA	359
1996	54860	Sorption of Heavy Metals and Radionuclides on Mineral Surfaces in Presence of Organic Co-Contaminants	Stanford University	RA	784
1996	54888	Manipulating Subsurface Colloids to Enhance Cleanups of DOE Waste Sites	Massachusetts Institute of Technology	RA	451
1996	55014	Kinetics and Mechanisms of Metal Retention/Release in Geochemical Processes in Soil	Alabama A&M University	RA	362
1996	55148	Hydrologic and Geochemical Controls on Radionuclides as Determined by Accelerator Mass Spectrometry	Lawrence Livermore National Laboratory	RA	1,563
1996	55249	Determination of Contaminant Metal Mobility as a Function of Temperature, Time, and Solution Chemistry	Lawrence Livermore National Laboratory	RA	1,130
1996	55284	Aquifer Transport of Th, U, Ra, and Rn in Solution and on Colloids	California Institute of Technology	RA	500
1996	55351	Isotopic Diagnostics Evaluation for Subsurface Characterization and Monitoring	Lawrence Berkeley National Laboratory	RA	763
1996	55396	Sorption of Colloids, Organics, and Metals onto Gas-Water Interfaces	Lawrence Berkeley National Laboratory	RA	1,387

Year	Grant No.	Title	Primary Research Institution	Problem Area	Funding ($000)
1997	60403	Phase Chemistry of Tank Sludge Residual Components	Sandia National Laboratory	HLW	1,157
1997	60355	Mineral Surface Processes Responsible for the Decreased Retardation of ^{137}Cs from HLW Tank Discharges	Pacific Northwest National Laboratory	RA	1,250
1997	59849	Radionuclide Immobilization in the Phases Formed by Corrosion of SNF	University of Michigan	SNF	481
Geophysics					
1996	55141	Imaging and Characterizing Underground Storage Tank Waste Materials Using Seismic Normal Modes	Massachusetts Institute of Technology	HLW	576
1996	54655	Hydrogeological-Geophysical Methods for Subsurface Site Characterization	Stanford University	RA	921
1996	54699	Dielectric and NMR Measurements to Determine the Pore-Scale Location of Organic Contaminants	University of British Columbia	RA	486
1996	55011	Surface and Borehole Electromagnetic Imaging of Conducting Contaminant Plumes	Lawrence Livermore National Laboratory	RA	1,088
1996	55218	Seismic Surface-Wave Tomography of Waste Sites	Georgia Institute of Technology	RA	358
1996	55300	3-D Spectral IP Imaging: Non-Invasive Characterization of Contaminant Plumes	Massachusetts Institute of Technology	RA	710
1996	55332	Hybrid Hydrologic-Geophysical Inverse Technique for the Vadose Zone Leachates Assessment and Monitoring	Sandia National Laboratory	RA	2,024
1996	55411	Joint Inversion of Geophysical Data for Site Characterization and Restoration Monitoring	Lawrence Livermore National Laboratory	RA	1,272
1997	60115	Advanced High Resolution Seismic Imaging	Rice University	RA	550
1997	60162	Very Early Time Electromagnetic (VETEM) Prototype Instrument Enhancements & Characterization	U.S. Geological Survey	RA	820
1997	60199	Seismic-Reflection and Ground Penetrating Radar for Environmental Site Characterization	University of Kansas	RA	630
1997	60328	High Frequency Electromagnetic Impedance Measurements for Characterization, Monitoring and Verification Efforts	Lawrence Berkeley National Laboratory	RA	816
Health Science					
1996	54546	Engineered Antibodies for Monitoring of Polynuclear Aromatic Hydrocarbons	University of California at Berkeley	H/E/R	891
1996	54684	Mechanism Involved in Trichloroethylene-Induced Liver Cancer	Pacific Northwest National Laboratory	H/E/R	1,800
1996	54856	Structural Biology of the Sequestration & Transport of Heavy Metal Toxins	University of Pennsylvania	H/E/R	980
1996	54931	A Novel Biomarker for Beryllium Sensitization in Humans	University of Vermont	H/E/R	649
1996	54940	Improved Risk Estimates for Carbon Tetrachloride	Lovelace Biomedical & Environmental Research Institute	H/E/R	1 ,000
1996	55032	Environmental Analysis of Endocrine Disrupting Effects from Hydrocarbon Contaminants in the Ecosystem	Tulane University	H/E/R	620
1996	55100	Human Genetic Marker for Resistance to Radiations and Chemicals	Columbia University	H/E/R	751

Year	Grant No.	Title	Primary Research Institution	Problem Area	Funding ($000)
1996	55356	An In Vivo Model to Evaluate the Health Impact of MW Chemicals	University of California, San Francisco	H/E/R	970
1996	55410	Determining Significant Endpoints for Ecological Risk Analysis	Savannah River Ecology Laboratory	H/E/R	898
1996	54584	Comparison of Elemental Waste Laden Soils Bioavailability Using in vivo and in vitro Analytical Methodology	Univ. of Medicine & Dentistry of NJ	RA	506
1996	55013	Biofiltration of Volatile Pollutants	Oak Ridge National Laboratory	RA	950
1996	55033	Characterization of Chemically Modified Hyperthermophilic Enzymes	Oak Ridge National Laboratory	RA	1,393
1996	55185	Strategies for Designing Inexpensive but Selective Bioadsorbants for Environmental Pollutants	University of Texas at Austin	RA	749
1996	55343	Enzyme Engineering for Biodegradation of Chlorinated Organic Pollutants	Lawrence Berkeley National Laboratory	RA	550
1997	59828	Bioavailability of Organic Solvents in Soils: Biologically Based Models for Human Risk Assessments	University of California, San Francisco	H/E/R	1,105
1997	59882	Measurements of Radon, Thoron, Isotopic Uranium and Thorium to Determine Exposure & Risk	New York University Medical School	H/E/R	630
1997	59918	Improved Radiation Dosimetry/Risk Estimates	Lovelace Biomedical & Environmental Research Institute	H/E/R	863
1997	60037	Estimation of Potential Population Level Effects of Contaminants on Wildlife	Oak Ridge National Laboratory	H/E/R	619
		Hydrogeology			
1996	54576	Inclusion of Interfacial Area Between Phases in the Physical and Mathematical Subsurface Multiphase Flow Description	University of Notre Dame	RA	845
1996	54680	Migration and Entrapment of DNAPLs in Heterogeneous Porous Media	University of Michigan	RA	582
1996	54793	Establishing a Quantitative Functional Relationship Between Capillary Pressure, Saturation and Interfacial Area	Cornell University	RA	962
1996	54908	Partitioning Tracers for In Situ Detection and Quantification of DNAPLs in Ground water Systems	University of Arizona	RA	777
1996	54950	Characterization of Contaminant Transport in Heterogeneous Vadose Regimes	Lawrence Livermore National Laboratory	RA	1,200
1996	55036	Colloid Transport and Retention in Fractured Deposits	Oak Ridge National Laboratory	RA	1,100
1996	55083	Behavior of Dense, Immiscible Solvents in Fractured Clay-Rich Soils	University of Tennessee – Knoxville	RA	600
1996	55109	New Permeameters for In Situ Characterization of Unsaturated Heterogeneous Permeability	New Mexico Institute of Mining & Technology	RA	612
1996	55196	In Situ, Field Scale Evaluation of Surfactant Enhanced DNAPL Recovery	Oregon State University	RA	616
1996	55216	In-Situ Characterization of DNAPLs Using Partitioning Tracers	University of Texas at Austin	RA	600
1996	55359	Chaotic-Dynamical Conceptual Model to Describe Fluid Flow and Contaminant Transport in a Fractured Vadose Zone	Lawrence Berkeley National Laboratory	RA	1,440

Year	Grant No.	Title	Primary Research Institution	Problem Area	Funding ($000)
1996	55395	Physics of DNAPL Migration and Remediation in the Presence of Heterogeneities	Sandia National Laboratory	RA	1,245
1997	60069	Least-Cost Ground water Remediation Design Using Uncertain Hydrogeological Information	University of Vermont	RA	373
1997	60158	Development of Radon-222 as a Natural Tracer for Monitoring NAPL Contamination Remediation	Oregon State University	RA	404
Inorganic Chemistry					
1996	54724	Synthesis of New Water-Soluble Metal-Binding Polymers	Los Alamos National Laboratory	D&D	1,120
1996	54646	Interfacial Radiolysis Effects in Tank Waste Speciation	Pacific Northwest National Laboratory	HLW	871
1996	54765	Enhanced HLW Sludge Processing: Hydrothermal Oxidation of Cr, Te, and Complexants by Nitrate	Los Alamos National Laboratory	HLW	1,020
1996	54807	Studies Related to Chemical Mechanisms of HLW Gas Formation	Georgia Institute of Technology	HLW	320
1996	55137	Novel Electrode Materials for Electrochemically-Based Remediation of MWs	California Institute of Technology	HLW	650
1996	55229	The Nox System in Nuclear Waste	Argonne National Laboratory	HLW	1,201
1996	54506	Acid-Base a Behavior in Hydrothermal Processing of Wastes	University of Texas at Austin	MW	380
1996	54828	HLW Processing: Spectroscopic Characterization of Redox Reactions in Supercritical Water	Furman University	MW	112
1996	54897	The Sonophysics and Sonochemistry of Liquid Waste Quantification and Remediation	University of Washington	MW	770
1996	55115	The Adsorption and Reaction of Halogenated Volatile Organic Compounds on Metal Oxides	Texas A&M University	MW	390
1996	55276	Fundamental Chemistry and Thermodynamics of Hydrothermal Oxidation Processes	Oak Ridge National Laboratory	MW	1,220
1996	54628	Colloidal Agglomerates in Tank Sludge: Impact on Waste Processing	Pacific Northwest National Laboratory	RA	1,788
1996	54834	Investigation of Homogeneous and Heterogeneous Sonochemistry for Hazardous Waste Destruction	Purdue University	RA	290
1996	55061	Contaminants Removal from Ground and Waste Waters via Reduction by Zero-Valent Metals	University of California, Riverside	RA	380
1996	55119	Phase Equilibria Modification by Electric Fields	Oak Ridge National Laboratory	RA	1,202
1997	60296	Research Program to Investigate the Fundamental Chemistry of Technetium	Lawrence Berkeley National Laboratory	HLW	900
1997	59934	Hazardous Gas Production by Alpha Particles in Solid Organic Transuranic Waste Matrices	University of Notre Dame	MW	400
1997	59960	Direct Investigations of Radionuclides Immobilization in SNF Alteration Phases	University of Notre Dame	SNF	782
1998	65411	Precipitation and Deposition of Aluminum-Containing Phases in Tank Wastes	Pacific Northwest National Laboratory	HLW	1,120
Materials Science					
1996	54914	Atmospheric-Pressure Plasma Cleaning of Contaminated Surfaces	University of California Los Angeles	D&D	1,212
1996	55380	In-Situ Spectro-Electrochemical Studies of Radionuclide Contaminated Surface Films on Metals	Argonne National Laboratory	D&D	1,005
1996	54672	Radiation Effects in Nuclear Waste Materials	Pacific Northwest National Laboratory	HLW	2,880
1996	54691	Radiation Effects on Materials in the Near-Field of Nuclear Waste Repository	University of New Mexico	HLW	408

Year	Grant No.	Title	Primary Research Institution	Problem Area	Funding ($000)
1996	54773	Microstructural Properties of HLW Concentrates and Gels with Raman and Infrared Spectroscopies	Los Alamos National Laboratory	HLW	465
1996	54982	Analysis of Surface Leaching Processes in Vitrified HLWs Using In-Situ Raman Imaging and Atomistic Modeling	University of Florida	HLW	559
1996	55188	Chemical Decomposition of High-Level Nuclear Waste Storage/Disposal Glasses Under Irradiation	Naval Research Laboratory	HLW	489
1996	55367	Investigation of Microscopic Radiation Damage in Waste Forms Using ODNMR and AEM Techniques	Argonne National Laboratory	HLW	698
1996	55110	Alternative Host Matrix for the Vitrification of Specialized Nuclear Waste Forms	University of Missouri-Rolla	MW	625
1996	55387	Photooxidation of Organic Waste Using Semiconductor Nanoclusters	Sandia National Laboratory	MW	1,251
1996	55094	Chemical and Ceramic Methods Toward Safe Storage of Actinides Using Monazite	Rockwell International	NM	1,287
1996	55382	Determination of Transmutation Effects in Crystalline Waste Forms	Argonne National Laboratory	NM	913
1997	59925	Modeling of Diffusion of Pu in Other Metals and of Gaseous Species in Plutonium-Based Systems	West Virginia University	D&D	435
1997	60363	Optimization of Thermochemical, Kinetic, and Electrochemical Factors Governing Radionuclides Partitioning during Melt Decontamination	Sandia National Laboratory	D&D	1,200
1997	59827	Influence of Radiation and Multivalent Cation Additions on Phase Separation and Glass Crystallization	University of Arizona	HLW	723
1997	60020	Stability of HLW Forms	Oak Ridge National Laboratory	HLW	762
1997	60345	New Silicotitanate Waste Forms: Development and Characterization	Pacific Northwest National Laboratory	HLW	1,200
1997	60362	Ion-Exchange Processes and Mechanisms in Glasses	Pacific Northwest National Laboratory	HLW	901
1997	60401	Mechanism of Pitting Corrosion Prevention By Nitrite in Carbon Steel Exposed to Dilute Salt Solutions	Westinghouse SR Co.	HLW	650
1997	60118	Fundamental Thermodynamics of Actinide-Bearing Mineral Waste Forms	Los Alamos National Laboratory	NM	1,150
1997	60387	Distribution & Solubility of Radionuclides & Neutron Absorbers in Waste Forms	Pacific Northwest National Laboratory	NM	1,800
1998	64896	Decontamination of Radionuclides from Concrete During and After Thermal Treatment	Oak Ridge National Laboratory	D&D	816
1998	64946	Mechanisms of Radionuclide-Hydroxycarboxylic Acid Interactions for Decontaminant of Metallic Surfaces	Brookhaven National Laboratory	D&D	1,150
1998	65366	Physical, Chemical and Structural Evolution of Zeolite-Containing Waste Forms	Pennsylvania State University	HLW	510
1998	65408	Mechanisms and Kinetics of Organic Aging in High-Level Nuclear Wastes	Pacific Northwest National Laboratory	HLW	900
1998	65422	Modeling of Spinel Settling in Waste Glass Melter	Pacific Northwest National Laboratory	HLW	875
Microbial Science					
1996	54666	Mechanisms, Chemistry, and Kinetics of Anaerobic Biodegradation of cDCE and Vinyl Chloride	Stanford University	RA	686
1996	54681	Dynamics of Coupled Contaminant and Microbial Transport in Heterogeneous Porous Media	Pacific Northwest National Laboratory	RA	2,035

Year	Grant No.	Title	Primary Research Institution	Problem Area	Funding ($000)
1996	54698	Rapid Mass Spectrometric DNA Diagnostics for Assessing Microbial Activity	Lawrence Berkeley National Laboratory	RA	675
1996	55031	Genetic Analysis of Stress Responses in Soil Bacteria for Mixed Contaminants Enhanced Bioremediation	Pacific Northwest National Laboratory	RA	1,022
1996	55105	Complete Detoxification of Short Chain Chlorinated Aliphatics	Michigan State University	RA	196
1996	55152	Molecular Profiling of Microbial Communities from Contaminated Sources	University of Maryland	RA	607
1996	55264	High Resolution Definition of Subsurface Heterogeneity for Understanding Natural Field Systems Biodynamics	Lawrence Berkeley National Laboratory	RA	2,790
1996	55416	Control of Biologically Active Degradation Zones by Vertical Heterogeneity	Idaho National Engineering and Environmental Laboratory	RA	2 ,000
1997	60150	Genetic Engineering of a Radiation-Resistant Bacterium for Mixed Wastes Biodegradation	University of Washington	MW	422
1997	59786	Design and Construction of *Deinococcus radiodurans* for Biodegradation of Organic Toxins	Uniformed Services Univ. of the Health Sciences	RA	800
		Plant Science			
1996	54837	Phytoremediation of Ionic and Methyl Mercury Pollution	University of Georgia	RA	825
1996	54889	Using Trees to Remediate Ground waters Contaminated with Chlorinated Hydrocarbons	University of Washington	RA	651
1996	54898	Molecular Dissection of the Cellular Mechanisms Involved in Nickel Hyperaccumulation in Plants	Northern Arizona University	RA	496
1996	55041	Molecular Characterization of a Novel Heavy Metal Uptake Transporter from Higher Plants	University of California, San Diego	RA	483
1996	55097	Heavy Metal Pumps in Plants	Scripps Institute	RA	325
1996	55118	Plant Rhizosphere Effects on Metal Mobilization and Transport	University of California, Davis	RA	455
1996	55278	Molecular Genetics of Metal Detoxification: Prospects for Phytoremediation	U.S. Dept. of Agriculture	RA	578
1997	60271	Characterization of a New Family of Metal Transport Proteins	Dartmouth College	RA	600
		Separations Chemistry			
1996	55103	Utilization of Kinetic Isotope Effects for the Concentration of Tritium	Oak Ridge National Laboratory	MW	1,354
1996	54716	Polyoxometalates for Radioactive Waste Treatment	Georgetown University	HLW	333
1996	54735	Development of Inorganic Ion Exchangers for Nuclear Waste Remediation	Texas A&M University	HLW	600
1996	54996	Ionizing Radiation Induced Catalysis on Metal Oxide Particles	Pacific Northwest National Laboratory	HLW	1,110
1996	55087	Design and Synthesis of the Next Generation of Crown Ethers for Waste Separations	Oak Ridge National Laboratory	HLW	1,920
1996	54571	Removal of Heavy Metals and Organic Contaminants from Aqueous Streams by Novel Filtration Methods	Northeastern University	MW	330
1996	54770	New Anion-Exchange Resins for Improved Separations of NM	Los Alamos National Laboratory	MW	1,212
1996	54791	Managing Tight-binding Receptors for New Separations Technologies	University of Kansas	MW	350

Year	Grant No.	Title	Primary Research Institution	Problem Area	Funding ($000)
1996	54847	Photocatalytic and Chemical Oxidation of Organic Compounds in Supercritical Carbon Dioxide	National Renewable Energy Laboratory	MW	660
1996	54942	Spectroscopy, Modeling and Computation of Metal Chelate Solubility in Supercritical CO_2	University of Notre Dame	MW	300
1996	55012	Extraction and Recovery of Mercury and Lead from Aqueous Waste Streams	Colorado State University	MW	333
1996	55223	De Novo Design of Ligands for Metal Separation	Washington University	MW	380
1996	54122	Broad Spectrum Catalytic System for Removal of Toxic Organics from Water By Deep Oxidation	Pennsylvania State University	RA	327
1996	54661	Electrochemical Processes for In-Situ Treatment of Contaminated Soils	University of Delaware	RA	317
1996	54926	Novel Ceramic-Polymer Composite Membranes for the Separation of Hazardous Liquid Waste	University of California Los Angeles	RA	360
1997	60041	Removal of Radioactive Cations and Anions Using Ligand-Modified Colloid-Enhanced Ultrafiltration	University of Oklahoma	D&D	539
1997	59982	Reactivity of Peroxynitrite: Implications for Hanford Waste Management and Remediation	Brookhaven National Laboratory	HLW	700
1997	59990	Fundamental Chemistry, Characterization, and Separation of Technetium Complexes in Hanford Waste	Los Alamos National Laboratory	HLW	730
1997	59993	Dynamic Effects of Tank Waste Aging on Radionuclide-Complexant Interactions	Los Alamos National Laboratory	HLW	559
1997	60017	Removal of Technetium, Carbon Tetrachloride, and Metals from DOE Properties	Pennsylvania State University	HLW	390
1997	60050	Chemical Speciation of Inorganic Compounds under Hydrothermal Conditions	University of Washington	HLW	850
1997	60123	Potential-Modulated Intercalation of Alkali Cations into Metal Hexacyanoferrate Coated Electrodes	University of Washington	HLW	300
1997	60313	Radiation Effects on Transport and Bubble Formation in Silicate Glasses	Argonne National Laboratory	HLW	750
1997	60096	Rational Synthesis of Imprinted Organofunctional Sol-Gel Materials for Toxic Metal Separation	University of Tennessee - Knoxville	MW	450
1997	60392	Radiolytic and Thermal Process Relevant to Dry Storage of SNFs	Pacific Northwest National Laboratory	SNF	891
1998	64865	Micelle Formation and Surface Interactions in Supercritical CO_2 Fundamental Studies for Actinides Extraction	Los Alamos National Laboratory	D&D	960
1998	64912	Interfacial, Transport, and Chemical Properties of Aqueous Surfactant Cleaners	Oak Ridge National Laboratory	D&D	570
1998	64965	Supercritical Carbon Dioxide-Soluble Ligands for Extracting Actinide Metal Ions from Porous Solids	Argonne National Laboratory	D&D	926
1998	65339	Ion Recognition Approach to Volume Reduction of Alkaline Tank Waste	Oak Ridge National Laboratory	HLW	900
1998	65351	Solution Effects on Cesium Complexation with Calixarene Crown Ethers	University of Idaho	HLW	296
1998	65368	Speciation, Dissolution, and Redox Reactions of Chromium Relevant to HLW Pretreatment and Separation	Lawrence Berkeley National Laboratory	HLW	899
1998	65378	Complexants for Actinide Element Coordination and Immobilization	Argonne National Laboratory	HLW	830
1998	65409	Electroactive Materials for Anion Separation-Technetium from Nitrate	Pacific Northwest National Laboratory	HLW	1,567

Acronyms and Abbreviations

D&D	Decontamination and Decommissioning
DOE-SC	Department of Energy Office of Science
DOE-ID	Department of Energy Idaho Operations Office
EMAB	Environmental Management Advisory Board
EMSP	Environmental Management Science Program
EM	Office of Environmental Management
H/E/R	Health, Ecology, and Risk
HLW	High Level Waste
MW	Mixed Waste
NM	Nuclear Materials
OSRP	Office of Science and Risk Policy
OST	Office of Science and Technology
RA	Remedial Action
RFA	Request for Applications
SNF	Spent Nuclear Fuel
STCG	Site Technology Coordinating Group